

Pigeon (as in numberless other instances) by the practice of publishing names without descriptions.

36. TRINGOIDES MACULARIUS (Linn.), Wils. Am. Orn. pl. 59. fig. 1.

37. GLOTTIS MELANOLEUCA (Gm.). — *T. vociferus*, Wils. Am. Orn. pl. 58. fig. 5.

38. QUERQUEDULA CAROLINENSIS (Gm.), Wils. Am. Orn. pl. 70. fig. 4.

4. ON THE PRESENCE OR ABSENCE OF AIR IN THE BONES OF BIRDS. BY EDWARD CRISP, M.D. ETC.

In my last communication upon this subject (see p. 9), I stated that I purposed adding to the list of birds dissected, and afterwards describing the air-sacs in the thoracic and abdominal cavities; the method by which air is admitted to the hollow bones, and the flight of birds in relation to these matters; but as the communication is longer than I expected, I will reserve the second part of my subject, viz. the admission of air to the bones, for my next and concluding paper.

My dissections* have not been so numerous as I could have wished, but the following list, in addition to that of my first communication, will, I think, enable me to form tolerably accurate conclusions. The birds since examined are the following:—

Kestrel. <i>F. tinnunculus.</i>	Jay. <i>C. glandarius.</i>
Kite. <i>F. milvus.</i>	Crow. <i>C. corvus.</i>
Common Buzzard. <i>F. buteo.</i>	Cuckoo. <i>C. canorus.</i>
Marsh Harrier. <i>F. æruginosus.</i>	Spotted Woodpecker. <i>P. major.</i>
American Eagle Owl. <i>S. Americanus.</i>	Grey Parrot. <i>P. erythacus.</i>
Long-eared Owl. <i>S. otus.</i>	Crested Parakeet. <i>P. Novæ Hollandiæ.</i>
Tawny Owl. <i>S. aluco.</i>	Impeyan Pheasant. <i>P. Impeyanus.</i>
Barn Owl. <i>S. flammea.</i>	Heron. <i>A. cinerea.</i>
Glossy Starling. <i>Juida nitens.</i>	Turnstone. <i>S. interpres.</i>
Spotted Fly-catcher. <i>M. grisola.</i>	Sarus Crane. <i>G. Antigone.</i>
Whin-chat. <i>S. rubetra.</i>	Bean Goose. <i>A. segetum.</i>
Wood Wren. <i>S. sibilatrix.</i>	Cereopsis Goose. <i>Cereopsis Novæ Hollandiæ.</i>
Willow Wren. <i>S. trochilus.</i>	Eider Duck. <i>A. mollissima.</i>
Blue Titmouse. <i>P. cæruleus.</i>	Smew. <i>Mergus albellus.</i>
Marsh Titmouse. <i>P. palustris.</i>	Red-necked Grebe. <i>P. rubricollis.</i>
Long-tailed Titmouse. <i>P. caudatus.</i>	Great Northern Diver. <i>C. glacialis.</i>
Black-headed Bunting. <i>E. schæniclus.</i>	Cormorant. <i>C. cormoranus.</i>
Canary. <i>C. canaria.</i>	

* I have examined the *skeletons* of numerous birds not mentioned in the above lists; but for the sake of greater accuracy, I think it better to confine myself to birds dissected soon after death.

The above list of thirty-five birds (eight of them foreign) includes eight rapacious; of these the Falconidæ had air in the humeri, femora, and bones of the trunk. The four Owls, Strigidæ, had air only in the humeri. Of the twelve passerine birds the Carrion Crow, the Jay, and the Tits had air only in the humeri; whilst the remaining seven, including five birds of passage, had no air in the bones. The humeri of the Impeyan Pheasant were hollow. In the four climbers the humeri contained air, but the femora were full of marrow. Of the three Waders, the Turnstone had the bones of the limbs free from air, but the humeri of the Heron and Sarus Crane were hollow. In three of the web-footed birds, the geese and ducks had hollow humeri, but the other four birds were without air in the bones of the extremities. So that only five Falconidæ of the above thirty-five birds, had air in the limbs; the arm-bones of nineteen were hollow, and in twelve the limb-bones contained marrow.

General Summary.—Adding these specimens to the fifty-two before described, the deduction is as follows. Air in many of the bones, 5 (Falconidæ); air in the humeri and not in the inferior extremities, 39; no air in the extremities, and probably in none of the other bones, 48. I say probably, because I have not inspected the trunk bones in all; but in the Swallow, Martin, Snipe, and many birds of passage, I have found all the bones filled with marrow; and I infer that when the bones of the limbs contain no air, that those of the trunk are also air-less.

It will be remarked that I have spoken chiefly of the bones of the extremities; but in many birds that have air in the humeri and femora, the sternum, clavicles, scapulæ, furcula and vertebræ are also supplied with this fluid. In the sternum, the air-holes are seen along the base of the keel; in some birds one air-hole only is present; in others, many exist, giving this part a cribriform appearance; the vertebræ, too, of some birds (especially the Falconidæ), as shown by a section of the spine of the Golden Eagle (*A. chrysaëta*), are composed of a beautiful net-work of bone, rendering them extremely light.

The fact that I am especially anxious to bring before the Society is, that in no bird that I have inspected did the bones of the extremities beyond the humeri and femora contain air.

Air-sacs in the thoracic and abdominal cavities.—I have examined these in the various classes of birds, and have found a great resemblance in all. They are mostly larger in high-flying birds and in those of long and rapid flight. The best mode of inspecting these cavities, which are formed by doublings of the pleural or peritoneal membranes, is to inflate them in the dead bird by means of a blow-pipe inserted in the trachea. A ligature is then placed upon the air-tube, and the body of the skinned bird exposed to a slow heat for a few hours; the membranes are by this means rendered dry and stiff, so that the thoracic and abdominal viscera may be removed. The body of the Long-eared Owl (*S. otus*) on the table has been thus treated, and many of the air-sacs are plainly seen. But let me describe more minutely the situation and form of these sacs in a few

birds. In the Barn Owl (*S. flammea*) the upper part of the chest is closed (as in most birds) by a tough membrane; in the thoracic cavity are two anterior and two posterior sacs on each side, and a middle cavity, which may be called the sternal sac. The inferior boundary of these sacs is a transverse duplicature at the base of the heart. In the upper part of the abdomen are two large sacs surrounding both lobes of the liver, and a triangular sac between them. On each side is a long anterior sac, the left extending from the lung above, having the stomach and gullet on the inner side and the ribs on the outer, bounded below by a membranous expansion extending from the last ribs to the abdominal muscles. On the right side nearly the same arrangement prevails. Posterior to the last described are two large sacs covering the kidneys, and extending to the coccyx.

In the abdomen the apertures in the lungs, by which air escapes into these cavities, are seated below the membranous diaphragm on each side; they are best seen by inflating the trachea when the bird is under water; but in some birds, the geese for example, the apertures are so large, that they are readily seen without inflation. In the Long-eared Owl (*S. otus*), the Tawny Owl (*S. aluco*), Marsh Harrier (*F. æruginosus*), and Common Kite (*F. milvus*), there is nearly the same arrangement. In the Gulls (*Laridæ*), which, judging from those dissected, have no air in the bones, these sacs are very large, and the bodies of these birds may be blown out to a great size. In the Pelican (*P. onocrotalus*), they are comparatively larger than in any bird I have examined.

These cells are all readily distended by inflation through the trachea, and when one of them is punctured the others become lax. If the inflation is made through the femur in one of the Falconidæ, the air escapes by the trachea, but I have not succeeded in inflating the abdominal cells through the humeral aperture; numerous experiments, however, will be required before one can speak positively upon this subject.

The aperture by which the air is admitted into the humerus is seated upon the upper and inner part of the head of this bone. It is of a rounded or oval form, sometimes consisting of a single opening, and in other instances, especially in the smaller birds, of several small perforations in a thin layer of bone. In the Black Swau (*C. niger*) there is a curious net-work at the entrance, consisting of eighty or a hundred openings. In the Golden Eagle (*A. chrysaëta*) the external aperture is large, with numerous small perforations. In the Snowy Owl (*S. nyctea*) it is of a circular form, with a few small openings through a thin layer of bone. In the thigh bone this aperture (when present) varies in shape: in some of the Owls two small openings exist, with a ridge between them; in the Golden Eagle and in most of the Falconidæ I have examined, it is of large size.

I have examined the humeral aperture in many young birds, Hawks, Owls and Magpies, when full-fledged, and have found it closed by a thick covering, the spot being indicated by the bloody appearance of the membrane. In these young birds, which in the

adult state have hollow humeri, the cavity of these bones is filled with thin marrow; and probably it is not till some time after the wings have been used, that the air-hole is formed by the absorption of the membranous covering.

In my last paper I stated that in one Swift (*C. apus*) the humeri were filled with marrow, and in two others they were hollow. I have only been able to obtain one other specimen, and in this the humerus was hollow; so that the first described was probably a young bird: and the same remark will apply to the Goat-sucker (*Caprimulgus*), which I now find has in the adult state a hollow humerus.

The hollow bones are strengthened at their extremities by cross and transverse beams; but notwithstanding the assertion of many, that a hollow bone is stronger than one containing marrow, I believe these bones to be considerably weaker: they are readily splintered by shot, as all who are accustomed to shoot a variety of birds are aware, from the number of broken wings among the accipitrine and gallinaceous birds. Some humeri containing marrow are of great strength and thickness, and very difficult to break; indeed a shot may pass through them without splintering the bone. The humerus of the Great Northern Diver (*C. glacialis*) on the table, is as thick and heavy as that of most quadrupeds: the cavity for the marrow is very small, and the parietes of the cylinder measure 3 lines. In addition to its great weight, it is 3 inches in length, forming a remarkable contrast with the Swift (*C. apus*), the length of which is only 4 lines.

Before closing this division of my paper, I may mention that most writers, in describing the humerus of a bird, speak of the air-hole as if generally present; but I believe in the majority of birds it is not to be found in this or any other bone.

The manner in which air is supplied, and the muscular apparatus connected with the humeral and femoral apertures, will, as I have said before, be given in another communication. I may merely observe here, that a prolongation of the thoracic air-sac is continued over the joint, so as to allow of the most perfect mobility. The thigh-bone, when hollow, is supplied with air in a like manner.

The flight of birds in relation to the presence of air in the bones.
—Notwithstanding the assertion before quoted, “that in the diurnal birds of prey, as in almost all other birds of flight, the femur is filled with air,” it will be found, on reference to the table, that scarcely one bird of flight has a hollow femur, and that the great majority of the British birds of passage have no air in the bones, judging from those examined; thus of the twenty-one birds of passage named in the tables, only five, the Turtle-Dove, Swift, Goat-sucker, Cuckoo and Bean Goose had hollow humeri, but these had no air in the femur; the remaining sixteen had marrow in all the bones of the limbs. It will be seen also that many birds of short flight, as the Tits, Woodpeckers, and others, have hollow humeri.

The presence of air too in the humerus does not appear to in-

fluence the mode of flight, as instanced by the Swift, Swallow, and Martin, the Tits and the Wagtails, the Starlings and Partridges. It will probably be found, when this matter is more fully investigated, that all soaring birds, and those that remain stationary in the air for a short time, have hollow humeri, as the Falcon and Skylark. It will be interesting also to observe the influence of climate as regards the presence of air in the bones.

If we look to the form and length of the bones of the wing, how different are they in birds possessing almost equal powers of flight! Take this example before me, the wing of the Swift and of the Marsh Harrier. The length of the bones of the former is:—humerus, 4 lines; cubitus, 8 lines; metacarpus, 8 lines; phalanges, 4 lines; total 2 inches; longest primary feather, $5\frac{1}{2}$ inches. Total length of wing, $7\frac{3}{4}$ inches.

In the Marsh Harrier the humerus is 4 inches in length; cubitus, $4\frac{3}{4}$ inches; metacarpus, $2\frac{1}{2}$ inches; phalanges, 1 inch; and pollex, $\frac{3}{4}$ of an inch; the longest primary feather, 12 inches; the length of the bones, 13 inches. Total length of wing, 23 inches.

The difference in the comparative length of the wing-bones in these birds is very remarkable, and numerous instances of a similar kind might be adduced; but I am obliged to limit myself to a few examples.

From the above investigation I have come to the subjoined conclusions:—

1st. That in the majority of British birds no air-cavities connected with the lungs are present in the bones.

2ndly. That the presence of air in the bones is not necessary for swift and long-continued flight, as instanced especially by the Gulls, Snipes, Swallows and Martins.

3rdly. That in no bird that I have examined was air found in the bones of the extremities beyond the *humeri* and *femora*.

Dr. Crisp exhibited a nest he had found in June last in the eastern part of Suffolk, which he believed to be that of the Great Grey Shrike (*Lanius excubitor*). It was placed in a thick hawthorn fence, about 12 feet from the ground, upon a large forked branch. It was composed chiefly of dried grass and a little moss on the exterior, the lining of short grass; no horsehair nor clay was present; the form rather shallow, and the size about that of the Missel Thrush (*T. viscivorus*), the diameter 6 inches, the greatest depth from the rim 4 inches; from the top of the dome next described to the bottom of the nest $9\frac{1}{2}$ inches. It was closely domed over with twigs, varying in length from 8 to 12 inches, a small hole being left in the rim for the entrance of the bird. The nest resembled that of the Magpie (*P. caudata*) in miniature, but, as before stated, no clay entered into its composition.

Dr. Crisp was inclined to think that this was the deserted and unfinished nest of the Grey Shrike, as two birds of the colour of a Jay were seen about the spot early in the spring by a person well

acquainted with all our common birds, and who stated that "he never before saw any birds of a similar kind." Dr. Crisp also thought that near a wood where Squirrels, Jays and Magpies were abundant, as in this locality, the bird might sometimes cover its nest. Mr. Wolf informed him, "that he once found a nest of this description in Germany, which he believed was that of the Grey Shrike."

November 10, 1857.

Dr. Gray, F.R.S., V.P., in the Chair.

The following papers were read:—

1. ON SEVERAL NEW SPECIES OF BIRDS FROM VARIOUS PARTS OF THE WORLD. BY JOHN GOULD, V.P., F.R.S. ETC.

Mr. Gould called attention to three species of Australian birds collected by Mr. Elsey during the recent expedition under A. C. Gregory, Esq., from the Victoria River on the north-west coast to Moreton Bay: two of these birds were of especial beauty and interest, viz. a *Psephotus* and a *Malurus*. The former is allied both to the *P. pulcherrimus* and *P. multicolor*, but differs from either, among other characters, by the rich yellow mark on the shoulder; and the *Malurus* is distinguished from all the other members of its genus by its larger size and by the beautiful lilac circlet which adorns the crown. The third species alluded to was a *Petroica*, allied to the *P. superciliosa*, a bird discovered by the late Mr. Gilbert in the neighbourhood of the Burdekin Lakes, and which with the present would admit of separation from the other species of the genus.

For the Parrakeet Mr. Gould proposed the name of

PSEPHOTUS CHRYSOPTERYGIUS.

Male.—Band across the forehead, extending above the eye to its posterior angle, very pale yellow; on the centre of the crown a patch of black; sides of the head, cheeks, neck, throat, upper portion of the abdomen, lower part of the back, rump and upper tail-coverts, verditer blue, somewhat greener on the cheeks and upper tail-coverts; immediately below the eye a tinge of yellow; back of the neck, back and scapularies, light greyish-brown, slightly tinged with green; shoulder and lesser wing-coverts fine yellow; primaries and secondaries black, margined externally with blue; feathers of the lower part of the abdomen, vent, and under tail-coverts, light scarlet, margined with greyish green; two centre tail feathers dark green at the base, passing into deep blue towards the extremity, and tipped with dull black; the remaining tail feathers light green crossed by an